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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/033,952	12/28/2001	Peter Michael Edic	RD-29,086	8581

41838 7590 03/25/2005

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EXAMINER

UPRETI, ASHUTOSH

ART UNIT PAPER NUMBER

2623

DATE MAILED: 03/25/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/033,952	EDIC ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	Ashutosh Upreti	2623	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-24 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 12 and 24 is/are allowed.
- 6) ☒ Claim(s) 1-4, 7-11, 13-17 and 20-23 is/are rejected.
- 7) ☒ Claim(s) 5, 6, 18 and 19 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 28 December 2001 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                        | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)               | Paper No(s)/Mail Date. ____.  |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>02/12/02</u> .  | 6) <input type="checkbox"/> Other: ____.                                    |

## **DETAILED ACTION**

### ***Drawings***

New corrected drawings in compliance with 37 CFR 1.121(d) are required in this application because figures 4 and 5 and the hand-written page numbers above all the drawings are not considered to be of suitable standard for publication. Applicant is advised to employ the services of a competent patent draftsman outside the Office, as the U.S. Patent and Trademark Office no longer prepares new drawings. The corrected drawings are required in reply to the Office action to avoid abandonment of the application. The requirement for corrected drawings will not be held in abeyance.

### ***Claim Objections***

Claims 1, 12, 13 and 24 objected to because of the following informalities: The terms "cyclically moving object" and "cycle" are used numerous times but are not clearly defined in the claims or the specification. They have been interpreted to be referring to the fact that the heart goes through a cycle when pumping blood. Given that the CT gantry moves in a rotational or "cyclic" manner, the terms could be confusing to a reader. Stating what is meant by "cyclically" and "cycle" somewhere in the specification or claims would cure this problem. Appropriate correction is required.

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-4, 8-10, 13-17, 21 and 22 are rejected under 35 U.S.C. 102(b) as being anticipated by Horiuchi (U.S. Patent 5,991,356).

As to claim 1, Horiuchi discloses scanning a cyclically moving object (column 2, line 48, here a heart beats in cycles) with a CT imaging system (column 4, line 54) including at least one of an area detector and a linear detector to encompass the desired field of view (column 4, line 67 – these are read as area detectors as they are used to detect an area) and a rotating gantry (column 5, line 20) to measure projection data during a plurality of cycles of the cyclically moving object (Figure 15); dividing a period of the cyclically moving object into a discrete number of phases (column 11, line 56); identifying an initial set of projection data at a desired phase of a first cycle (column 11, line 19) at a first angle (column 11, lines 8-9); identifying at least one subsequent set of projection data at the same desired phase of a subsequent cycle at an angle that is different from the first angle (column 12, line 31-34 and Figure 15); combining the initial set of projection data with each subsequent set of identified projection data and using a reconstruction algorithm to generate a three-dimensional image (column 10, lines 59-62. Here if all slices are combined, as can be done, the initial set must be included. Also, since this is being done by software on a computer, the use of an algorithm is inherent); repeating said identifying an initial set of projection data at a desired phase of a first cycle at a first angle, identifying at least one subsequent set of projection data at the same desired phase of a subsequent cycle at an angle that is different from the first

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angle, and combining the initial set of projection data with each subsequent set of identified projection data and using a reconstruction algorithm to generate a collection of three-dimensional images for the desired phases (column 10, lines 61-62 – here it is disclosed that this entire process, described previously, can be repeated at every phase in the cycle); and temporally filtering the collection of three-dimensional images (column 10, line 61) on a pixel by pixel basis (Figure 13 + column 10 line 66 – column 11 line 1 shows that the image data for different phases is shifted in time. In addition, column 11, lines 50-54 shows that image data of different phases can be stored and reconstructed according to the time/rotational location of the scan. The phrase “pixel by pixel” is read as meaning going through the image data).

As to claim 2, Horiuchi discloses that one rotation of the gantry is 360 degrees (column 10, line 41).

As to claim 3, Horiuchi discloses that the object is a patients heart (column 2, line 38) and that the cycle represents the cardiac cycle (Figure 15) and that phase divisions (see claim 1 rejection) are done in accordance with the patients ECG signal (column 5, line 29).

As to claim 4, Horiuchi discloses that one rotation is within one breath of a patient (Figures 10 and 11 and column 9, lines 52-56). Here the respiration information is obtained and the scan (one or more rotations) is completed when the breath is held to minimize movement.

As to claim 8, Horiuchi discloses that one gantry rotation is completed during the data acquisition window (Figure 13). Here the time for one scan (0 to T) is shown to be the same as a full rotation (0 to  $2\pi$ ).

As to claim 9, Horiuchi discloses obtaining data from a continuous scan that may last over a plurality of rotations (column 10, lines 45-47).

As to claim 10, Horiuchi discloses rotating the gantry (column 7, lines 2-4) an angular range (column 11, line 60, here the range is a half-scan) to utilize a segment reconstruction technique (column 11, lines 64).

As to claim 13, the limitations of the claim are rejected for the same reasons as in the rejection for claim 1.

As to claim 14, the limitations of the claim are rejected for the same reasons as in the rejection for claim 2.

As to claim 15, the limitations of the claim are rejected for the same reasons as in the rejection for claim 9.

As to claim 16, the limitations of the claim are rejected for the same reasons as in the rejection for claim 3.

As to claim 17, the limitations of the claim are rejected for the same reasons as in the rejection for claim 4.

As to claim 21, the limitations of the claim are rejected for the same reasons as in the rejection for claim 8.

As to claim 22, the limitations of the claim are rejected for the same reasons as in the rejection for claim 10.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 7, 11, 20 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Horiuchi as applied to claim 1 above, and further in view of Tuy (U.S. Patent 5,243,664).

As to claim 7, Horiuchi as applied above does not expressly disclose forward projecting data from a region outside the object, subtracting the forward projected data from the total data for each view angle and reconstructing the residual data to minimize artifacts.

Tuy discloses, forward projecting data for a region of an image (column 5, lines 33-35) and then subtracting it from the total data (column 5, lines 36-39) to minimize artifacts (column 4, line 63).

It would have been obvious to a person of ordinary skill in the art to use the forward projection and subtraction techniques of Tuy when processing the images of each view angle from Horiuchi as they both deal with images from CT scanners. This would help minimize artifacts in the image, thus providing motivation to a person of ordinary skill in the art.

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As to claim 11, Horiuchi as applied above does not expressly disclose reconstructing a collection of volumetric images using iterative methods.

Tuy discloses reconstructing a collection of volumetric images using iterative methods (Figure 1, 20, 30, 34 and 42 are iterations in image reconstruction). Tuy takes images from a CT scanner, which is known by people of ordinary skill in the art, to take a collection of images that are combined to form a 3D image.

It would have been obvious to a person of ordinary skill in the art to use the iterative reconstruction techniques of Tuy when processing the images of each view angle from Horiuchi as they both deal with images from CT scanners. This would help minimize artifacts in the image, thus providing motivation to a person of ordinary skill in the art.

As to claim 20, the limitations of the claim are rejected for the same reasons as in the rejection for claim 7.

As to claim 23, the limitations of the claim are rejected for the same reasons as in the rejection for claim 11.

***Allowable Subject Matter***

Claims 12 and 24 are allowed.

The following is a statement of reasons for the indication of allowable subject matter:



The combination of a single high-resolution detector and a plurality of low-resolution detectors on a CT system was not found in the prior art. The other limitations in claims 12 and 24 are discussed in the rejections for claims 1, 3 and 7.

Claims 5, 6, 18 and 19 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

As to claims 5, 6, 18 and 19, the combination of a single high-resolution detector and a plurality of low-resolution detectors on a CT system was not found in the prior art. Regarding claims 6 and 19, the aspects regarding encompassing the heart and surrounding region in the scan are discussed further in Chao (cited below).

### ***Conclusion***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Fluhrer (U.S. Patent 6,266,553) discloses information on gantry rotation in relation to data capture time (column 3, lines 15-20) when scanning a heart (column 1, line 53). Also disclosed is correlating an ECG signal with the scan (column 3, lines 1-2) and rotating the gantry a full 360 degrees (column 2, lines 53-54).

Chao (U.S. Patent 5,771,269) discloses a single high-resolution detector and a single low-resolution detector (column 9, lines 14-16). Here, both the high resolution and low resolution detectors encompass the same field of view including the desired object (Figure 1).

Pelc (U.S. Patent 5,533,080) discloses using high and low radiation energies (column 6, line 14) and a plurality of detectors (column 7, line 19), which can be made to detect two different energy levels (column 7, lines 27-28).

Mertelmeier (U.S. Patent Publication 2003/0081821) is not prior art but it discloses detectors whose resolutions can be altered (paragraph 0041, lines 10-14) and obtaining an image that has high-resolution in the middle and low-resolution at the edges (column 5, lines 1-3).

### ***Contact Details***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ashutosh Upreti whose telephone number is (703) 306 4087. The examiner can normally be reached on Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amelia Au can be reached on (703) 308-6604. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A.U.  
March 21, 2005

  
**Jon Chang**  
**Primary Examiner**